SUPPLEMENTAL OFFICE ACTION

This Office Action is being provided as a supplemental to the final Office action mailed on 3 September 2009 in order to correct typographical errors.

Information Disclosure Statement

1. The information disclosure statement (IDS) submitted on 4 May 2009 are being considered by the examiner.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 1-12 and 14-17 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Specifically, claim 1 recites "the heterocyclic compound represented by the formula (I) is not indolizine". However, this is not supported by the original disclosure, which merely sets forth the compound of formula (I) without excluding indolizine, which is satisfies formula (I) as set forth by the Applicant's disclosure. Although the specification does not

provide a specific example of indolizine among the limited examples compounds 1-331, the mere absence of a positive recitation is not basis for an exclusion. See MPEP § 2173.05(i).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1, 5, 9-12 and 14-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hanna (`787) in view of Klauk (Solid-State Electronics, Vol. 47; supplied to Applicant with Office Action dated 11 July 2008).

a. Regarding claims 1, 5 and 9, Hanna teaches an organic thin film transistor (Col. 376, Lines 11-15) comprising a gate electrode ("GATE ELECTRODE" in Fig. 6), a source electrode ("SOURCE ELECTRODE" in Fig. 6), a drain electrode ("DRAIN ELECTRODE" in Fig. 6), an insulating layer ("GATE DIELECTRIC LAYER" in Fig. 6) and an organic semiconductor ("LIQUID CRYSTALLINE CHARGE TRANSPORT MATERIAL" in Fig. 6) on a substrate ("SUBSTRATE" in Fig. 6). The organic semiconductor comprises a heterocyclic compound containing a nitrogen atom formed by condensation between five member rings each having a nitrogen atom at their condensation sites which meets the compound of Formula (IV), such as 6-(4-

butylphenyl)-2-nonylimidazo[2,1-b][1,3,4]thiadiazole (see Table 190 in Col. 149). The compound of formula (IV) is met by Z_4 = a thiadiazole 5-member ring , R_{41} = hydrogen, and R_{42} = a C_6 aryl group substituted with a C_4H_9 alkyl group.

The language, term, or phrase "formed by condensation between five member rings each having a nitrogen atom at their condensation sites or between a five-member ring and a six-member ring each having a nitrogen atom at their condensation sites", is directed towards the process of making a heterocyclic compound containing nitrogen. It is well settled that "product by process" limitations in claims drawn to structure are directed to the product, per se, no matter how actually made. *In re Hirao*, 190 USPQ 15 at 17 (footnote 3). See also, *In re Brown*, 173 USPQ 685; *In re Luck*, 177 USPQ 523; *In re Fessmann*, 180 USPQ 324; *In re Avery*, 186 USPQ 161; *In re Wethheim*, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); *In re Marosi* et al., 218 USPQ 289; and particularly *In re Thorpe*, 227 USPQ 964, all of which make it clear that it is the patentability of the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or otherwise. As such, the language "formed by condensation" only requires a structure having five member rings each having a nitrogen atom at a common point shared between the two rings, or a structure having a nitrogen atom at a common point shared between a five member ring and a six member ring, which does not distinguish the invention from Hanna, who teaches the structure as

claimed with the 6-(4-butylphenyl)-2-nonylimidazo[2,1-b][1,3,4]thiadiazole organic semiconductor compound.

The Examiner also notes that a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. See, e.g., *In re Pearson*, 181 USPQ 641 (CCPA); *In re Minks*, 169 USPQ 120 (Bd Appeals); *In re Casey*, 152 USPQ 235 (CCPA 1967); *In re Otto*, 136 USPQ 458, 459 (CCPA 1963). See MPEP §2114. The recitation of "which controls an electric current flowing between the source and the drain by applying an electric voltage across the gate electrode" does not distinguish the present invention over the prior art of Hanna who teaches the structure as claimed and the functionality of the transistor.

Hanna is silent regarding conventional details of a organic transistor structure such as the distance between the source and drain electrodes being, for example, 5 μm to 1 mm apart.

However, Klauk teaches an organic thin film transistor (Fig. 1, for example) with conventional channel lengths of 5-100 μm by setting the distance between the source and drain electrodes, for example, and the effects on device characteristics (see Page 299). It would have been obvious to one of ordinary skill in the art at the time the invention was made to set the channel length of Hanna to be anywhere from 5-100 μm, for example. One would have been motivated to do so since Klauk teaches that channel lengths of this order have a higher carrier mobility and low threshold voltage (Klauk Fig. 3, for

example) and all of these channel lengths result in functional transistor devices. Furthermore, repeating the experiments of Klauk with all of the channel lengths of 5-100 μm on the device of Hanna would provide one skilled in the art a characterization of the device performance. It has been held that where the general conditions of a claim are disclosed in prior art, discovering the optimum or working ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

While Hanna teaches that the organic semiconductor has an electron carrier mobility of at least 10^{-5} cm^2/Vs (Abstract; Col. 1, Line 56, Col. 2, Lines 13-16 and 24-25; Col. 377, Lines 40-45; Col. 378, Line 67; Col. 379, Line 1, for example), Hanna does not teach that 6-(4-butylphenyl)-2-nonylimidazo[2,1-b][1,3,4]thiadiazole, specifically, has an electron mobility of 10^{-3} cm^2/Vs or more. However, Hanna teaches that the organic semiconductor layers are formed into liquid crystals thereby aligning the charge transportability between the molecules and forming high mobility defect-free organic crystals (Abstract; Col. 1, lines 50-56; Col. 2, Lines 20-25; Col. 375, Lines 16-18, for example) causing cited examples have an electron mobility to exceed 10^{-3} cm^2/Vs (see, for example, Col. 377, Lines 40-45). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the organic semiconductor layer with a mobility of 10^{-3} cm^2/Vs or more. A reasonable expectation for success exists because Hanna teaches forming single crystals of defect-free organic domains which repeatedly show mobilities on this scale in such a configuration. One would be motivated to provide a high mobility for the organic semiconductor because

Hanna teaches that high mobility allows for high-speed response of the device (Col. 2, Lines 5-10 and 15-16, at least).

b. Regarding claim 10, Hanna teaches that the source and drain electrodes are formed on the insulator layer (see Fig. 6). The examiner notes that the use of the term "on" does not require direct physical contact between recited elements and intervening elements, such as the organic semiconductor layer can be therebetween.

c. Regarding claim 11, Hanna teaches that the source and drain electrodes are formed on the organic semiconductor layer (see Fig. 6). The examiner notes that the use of the term "on" does not require direct physical contact between recited elements and intervening elements can be therebetween, although the configuration of Hanna shows a direct physical contact between the source and drain electrodes with the organic semiconductor layer.

d. Regarding claim 12, Hanna teaches that the source and drain electrodes are formed on the substrate (see Fig. 6). The examiner notes that the use of the term "on" does not require direct physical contact between recited elements and intervening elements can be therebetween, although the configuration of Hanna shows a direct physical contact between the source and drain electrodes with the substrate.

e. Regarding claim 14, Hanna teaches that the source and drain electrodes are juxtaposed on the substrate (see Fig. 6). The examiner notes that the use of the term "on" does not require direct physical contact between recited elements and intervening elements can be therebetween, although the configuration of Hanna shows a direct physical contact between the source and drain electrodes with the substrate.

f. Regarding claim 15, Hanna teaches that the source and drain electrodes are formed in contact with a same plane (see Fig. 6).

g. Regarding claim 16, Hanna teaches that the transistor has a device structure of a pair of the source and drain electrode, the organic semiconductor layer, the insulating layer, and the gate electrode formed on the substrate in that order (see Fig. 6).

h. Regarding claim 17, Hanna teaches that the source and drain electrodes are in contact with the organic semiconductor layer (see Fig. 6).

Response to Arguments

6. Applicant's arguments with respect to claims 1-12 and 14-17 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of final Office action mailed 3 September 2009. In the event a first reply is filed within TWO MONTHS of the mailing date of final Office action mailed 3 September 2009 and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final Office action mailed 3 September 2009.

Contact Information

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MATTHEW W. SUCH whose telephone number is (571)272-8895. The examiner can normally be reached on Monday - Friday 9AM-5PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kiesha Rose can be reached on (571) 272-1844. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MWS
8/21/09

/Douglas M Menz/
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9/11/09